

CLAIMS

What is claimed is:

1. A method for forming a metallic composite structure, comprising:
 - placing sheet metal between a die and a platen, said die and said platen configured to sealingly engage a periphery of said sheet metal for forming a die enclosed area of the sheet metal, said die having a forming surface defining a cavity between said forming surface and said metal sheet;
 - moving said die and platen to their closed position such that said die engages the periphery of said sheet metal at said metal sheet;
 - adjusting the temperature of said sheet metal to the material blow forming temperature;
 - applying gas pressure to a surface of the sheet metal so as to form the sheet metal to at least partially conform with said die forming surface; and
 - coupling metallic foam substrate to the sheet metal.
2. The method according to Claim 1, wherein coupling metallic foam substrate to the sheet metal occurs prior to applying gas pressure to form the sheet metal.
3. The method according to Claim 1, wherein coupling metallic foam substrate to the sheet metal occurs after to applying gas pressure to form the sheet metal.

4. The method according to Claim 3, further comprising applying an adhesive between the metallic foam and the sheet metal.

5. The method according to Claim 1, wherein coupling metallic foam substrate to the sheet metal is deforming the sheet metal to form a pair of interfacial surfaces which couple to a pair of surfaces on the metallic foam.

6. The method according to Claim 1, wherein placing sheet metal between a die and a platen is placing a metal sheet having a depending metallic foam sheet disposed thereon.

7. The method according to Claim 1, wherein placing sheet metal between a die and a platen is placing a metal sandwich structure having a first and second sheet metal layers and coupling a metallic foam substrate is positioning a metallic foam layer therebetween.

8. The method according to Claim 1 wherein the sheet metal is a superplastically formable alloy.

9. The method according to Claim 1 wherein the metallic foam is a superplastically formable alloy.

10. The method according to Claim 1 further comprising brazing material between the foam and the sheet metal.

11. The method according to Claim 1 wherein the metallic foam is a high purity aluminum alloy reinforced with a low volume fraction of (~1 micron) ceramic particles.

12. A composite structure made by a process comprising:

- providing a first metal sheet said metal sheet having a first surface and a second surface;
- positioning a metal foam against a surface of said first metal sheet, said metal foam having a first metal foam surface interfacing to said first metal sheet surface;
- heating said first metal sheet, said metal foam, to a forming temperature sufficient to fuse the resultant metallic foam to said first and to said second metal sheets;
- cooling said first metal sheet, said metallic foam, so that a planar panel is formed;
- placing planar panel between a die and a platen, said die and said platen configured to sealingly engage a periphery of said planar panel for forming a die enclosed area of the planar panel, said die having a forming surface defining a cavity between said forming surface and said planar panel;

moving said die and platen to their closed position such that said die engages the periphery of said planar panel at said metal sheet;

adjusting the temperature of said planar panel to the material blow forming temperature;

applying gas pressure to a surface of the planar panel so as to form the planar panel to at least partially conform to said die forming surface.

13. The method according to Claim 12, wherein placing planar panel between a die and a platen is placing a metal sandwich structure having a second sheet metal layer coupled to the metallic foam substrate.

14. The method according to Claim 12 wherein applying gas pressure to a surface of the planar panel is applying gas pressure at a predetermined rate so as to not cause a rupture of the first metal sheet.

15. The composite structure of Claim 13, wherein said first and second metal sheets comprise a superplastically deformable alloy.

16. The composite structure of Claim 15, wherein said first and second metal sheets comprise aluminum.

17. The composite structure of Claim 13, wherein said first metal sheet, said second metal sheet, and said metallic foam comprise a superplastically deformable alloy.

18. The composite structure of Claim 13, wherein said metallic foam comprise a superplastically deformable alloy.